Total No. of Questions : 8] SEAT No. :

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[4760] - 1047

M.E. (Civil) (Water Resources and Environment Engineering)

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2013 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Use data sheet.***

Q1) a) State the stability of atmosphere for the following data Temp. of air at ground = 30°C. Temp. of air at 200m height = 20°C. If a balloon is release from a ground after 1 hour reach to height of 100m at that time temperature of 22°C. **[4]**

b) Explain radiation and types of radiation. **[3]**

c) A high volume sampler is run for 30 min @ $20m^3$/min air. Initial weight of filter paper is 5 gm after 30 min weight of filter paper is 10 gm what is concentration of dust particle in microgram/m^3. **[3]**

Q2) a) Design multi cyclone chamber for flue gas of $10m^3$/sec. Assume all the necessary data. **[4]**

b) A fabric filter must process $3m^3$/s of flue gas. Design the bag house filter with air to cloth ratio of $4m^3/min/m^2$ Determine no. of bags and physical arrangement. Take dia. of each base as 200mm. **[3]**

c) Explain working of adsorption process in details. **[3]**

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Q3) a) A gas has density of 1.89 kg/m^3 at a pressure of 1 bar with temperature of 30°C A mass of 0.9 kg of the gas requires a heat transfer of 300 kJ to raise the Determine. **[3]**

i) Characteristic gas constant.

ii) Cp of the Gas

iii) Cv of the Gas

Change in internal energy of gas

b) Explain steam curve. **[3]**

c) Explain vapor absorption system with diagram. **[4]**

Q4) a) Determine reaction order of reactant removal for the data given in table : **[4]**

concentration	230	180	110	60	40	22
Time (minute)	0	9	20	30	42	33

b) Explain working & principle of ion exchange process. **[3]**

c) A cold fluid flow through heat exchanger at rate of 20m^3/hr. The temperature at entry of fluid and exit is 38°C and 62°C. The another fluid enters at rate of 30m^3/hr and temperature is 112°C. Find the area required for heat exchanger in parallel and counter cement flow conditions. **[3]**

Q5) a) Write short note on toxicity test. **[3]**

b) Explain the concept of anaerobic sludge digestion with three phases such as hydrolysis, acidogensis, methonagesis and also explain conventional sludge digester with diagram. **[4]**

c) A one cubic meter of air was sound to contain 100 microgram/m^3 of CO_2. The temperature & pressure are 20°C and 103.12 kPa when the air sample was taken what was the concentration of CO_2 in PPM. **[3]**

Q6) Explain working mechanism of : **[10]**

a) pH meter

b) Flame photometer

c) Atomic Absorption Spectrophotometer

Q7) a) What are different type of reactor used in water treatment process. **[6]**

b) Design ASP for Industrial waste water of 10,000 m^3/d, BOD of I/F = 200 mg/L, E/F BOD = 10 mg/L, Y = 0.5, K_d = 0.05/ day, MLSS = 4000 mg/L, Return sludge concentration = 10,000 mg/L, MCRT = 10 days **[4]**

Determine 1. Volume of reactor

i) F/M ration.

ii) OLR

iii) Oxygen requirement

iv) Recycle ratio

Q8) Explain uses of algae and problems caused by algae in water along with their controlling measures. **[10]**

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